

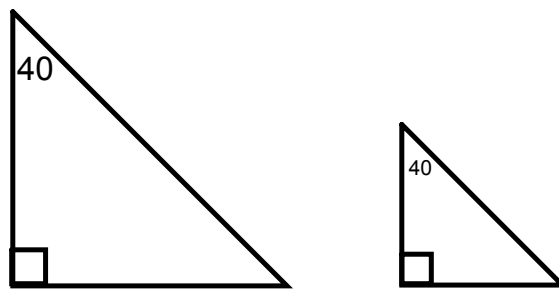
3/19/18 "Too many of us are not living our dreams because we are living our fears."-Les Brown

HW: "Related Rates" packet page 14 #2  
Test 3 on Wednesday 3/28

AIM: One more Related Rates problem

Warm Up:

1. What do we know about these triangles?



Similar triangles.  
Therefore the sides are in proportion.

## Page 8

1) A water tank in the shape of a right circular cone has a height of 10 feet. The top rim of the tank is a circle with a radius of 4 feet. If water is being pumped into the tank at the rate of 2 cubic feet per minute, what is the rate of change of the water depth, in feet per minute, when the depth is 5 feet?

① Know:

$$h(\text{tank}) = 10 \text{ ft}$$

$$r(\text{tank}) = 4 \text{ ft}$$

$$\frac{dV}{dt} = 2 \text{ ft}^3/\text{min}$$

$$h(\text{water}) = 5 \text{ ft}$$

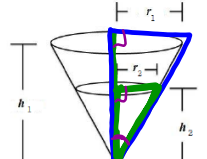
② Need:  $\frac{dh}{dt}$  ← water

③  $V = \frac{1}{3} \pi r^2 h$

$$\frac{dV}{dt} = \frac{1}{3} \pi r^2 \frac{dh}{dt} + \frac{2}{3} \pi r \left( \frac{dr}{dt} \right) h$$

Don't know and can't find

Cone

	<p>The relationship between the radius and height of the cone and the radius and height to the water:</p> $\frac{r_1}{h_1} = \frac{r_2}{h_2}$	<p>The volume of a cone:</p> $V = \frac{1}{3} \pi r^2 h$ <p>(where r is its radius and h is its height.)</p>
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④  $\frac{\text{radius of tank}}{\text{height of tank}} = \frac{\text{radius of top water}}{\text{height top water}}$

$$\left( \frac{4}{10} \right) = \frac{r}{h} \rightarrow \left( \frac{4}{10} h \right) = r$$

replacement for "r"

$$V = \frac{1}{3} \pi \left( \frac{4}{10} h \right)^2 h$$

$$V = \frac{1}{3} \pi \left( \frac{16}{100} h^2 \right) h$$

$$V = \frac{16}{300} \pi h^3$$

⑤  $\frac{dV}{dt} = \frac{48}{300} \pi h^2 \frac{dh}{dt}$

$$2 = \frac{48}{300} \pi (5)^2 \frac{dh}{dt}$$

$$2 = \frac{4}{25} \pi \cdot 25 \frac{dh}{dt}$$

$$2 = 4\pi \frac{dh}{dt}$$

$$\frac{2}{4\pi} = \frac{dh}{dt}$$

$$\frac{1}{2\pi} \frac{\text{ft}}{\text{min}}$$